THE MAGAZINE OF METAL COMPONENT DESIGN AND PRODUCTION

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Precision Metal

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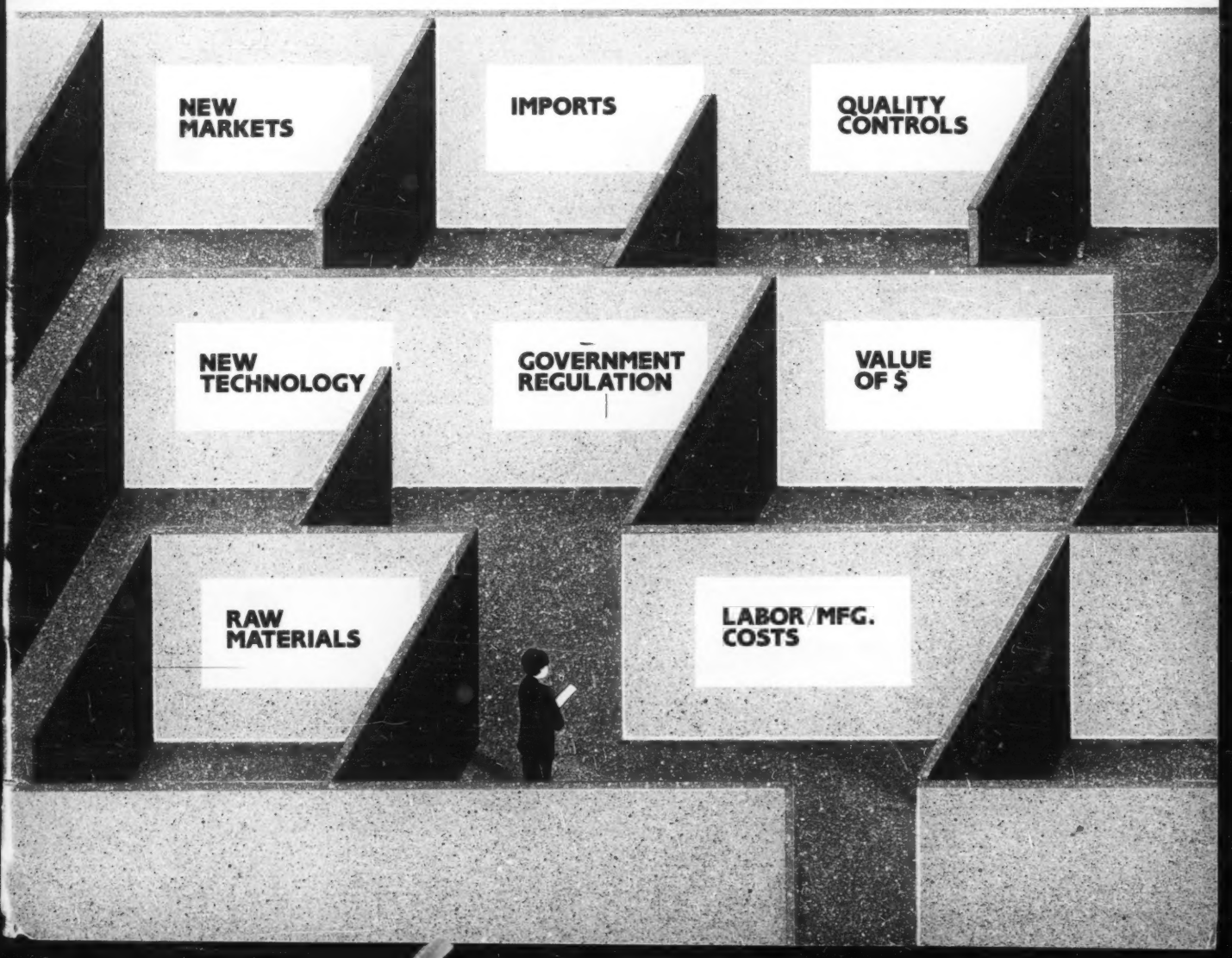
STATE OF THE INDUSTRY

OPPORTUNITIES & OBSTACLES FOR METALWORKING



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Precision Metal

THE MAGAZINE OF METAL COMPONENT DESIGN AND PRODUCTION

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ABOUT THE COVER:
The metalworking industries encounter a variety of opportunities and obstacles as they try to increase efficiency, productivity and profits. The State of the Industry Report examines both these areas and looks to what is ahead for the industries in 1986.
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State of the Industry Report

The stabilization in the economy has caused a leveling off of business in the metalworking industries, as industry executives expect sales to plateau and hold their own throughout 1986.

But as the metalworking industries begin next year, they will be facing a series of obstacles and opportunities. Imports, high interest rates and the high value of the dollar are causing uncertainty in the industries and most executives said they are approaching 1986 with "cautious optimism."

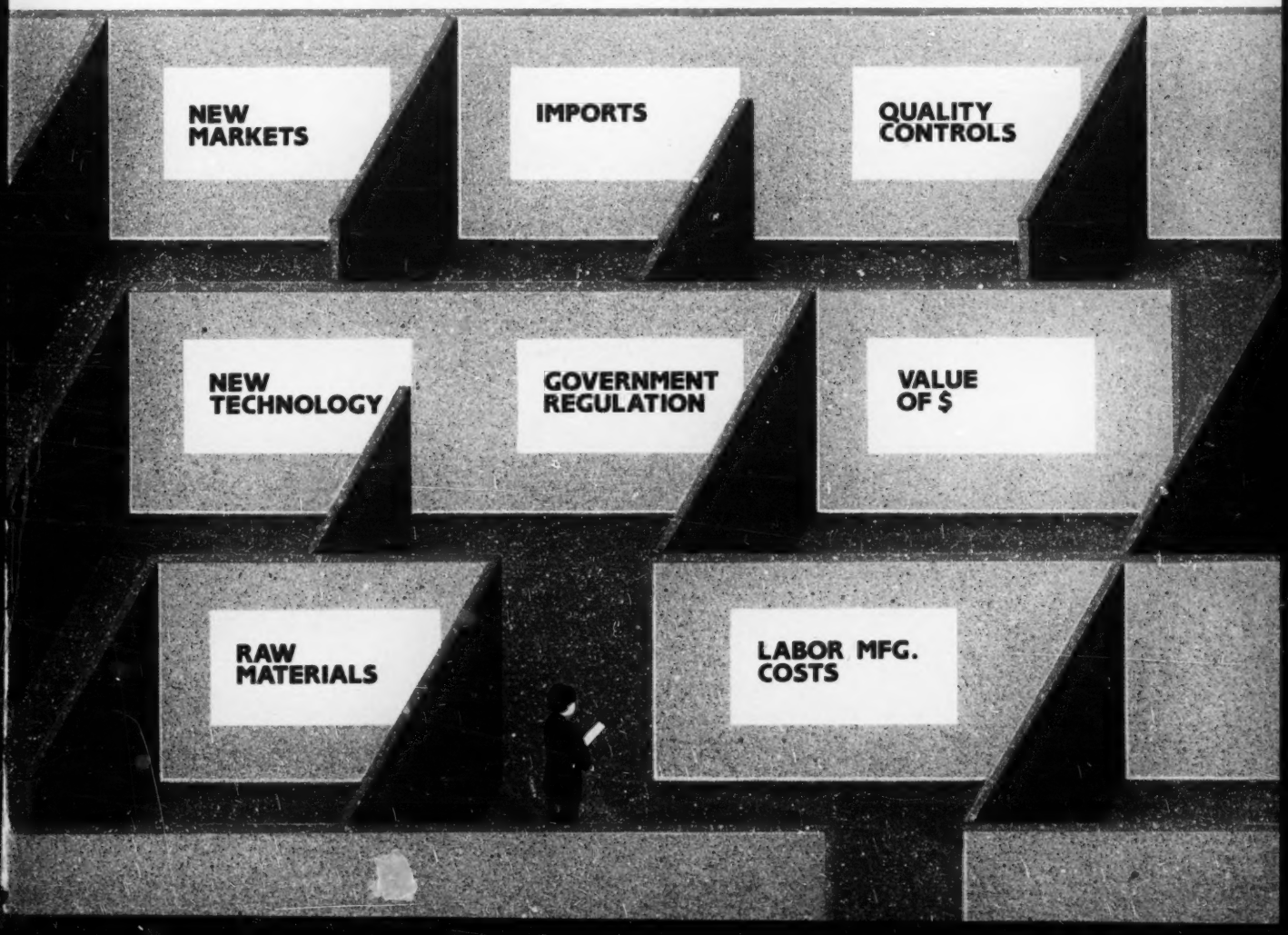
In addition, President Reagan's proposed tax plan, if passed in its current form, could hinder capital-intensive, heavy manufacturing industries. Executives are also waiting to see what happens with Reagan's plan to increase exports and curb the value of the dollar.

However, there are opportunities for the industries. New technology is helping industry increase efficiency, quality of parts, productivity and profits. The metalworking industries are also looking for new applications, and executives agree that successfully venturing into new markets will be the key to success in 1986.

This year's State of the Industry Report is divided into five sections. It begins with a *General economic overview* in which the state of the economy is examined. That section is followed by a *Raw materials outlook* which analyzes several industrial metals and describes their outlook for 1986 and beyond. *Industry reports* is the third element and features special reports on the seven metalworking processes *Precision Metal* covers editorially. Within this section are interviews with association and company executives to gain their insight about the future of their industries.

Finally, *Major end use markets* and *Other end use markets* round out the report and provide insight into four major end use markets and seven other markets.

—*Precision Metal*



General economic overview

By Patricia K. Pakes, associate editor

There probably won't be a recession in 1986, but beyond that point, economists can't agree on whether the U.S. economy will continue its sluggish growth or whether there's a boom ahead in the next 12 months.

Declining interest rates, low inventory levels, and recent movements in business-cycle yardsticks all point to a boom, says David Levine, chief economist at Sanford C. Bernstein & Co., investment bankers.

The trade deficit, bloated value of the dollar, and those same low inventory levels are a few reasons why Lawrence Chimerine sees modest growth in the economy in 1986. Chimerine is chairman of the economic forecasting firm of Chase Econometrics. Chimerine also cites low capacity utilization rates in manufacturing as a reason why the economy may remain sluggish.

According to the U.S. Department of Commerce, industrial production declined 1% in September while the gross national product, the broadest measure of economic health, grew at a 3.3% annual rate from July to September.

The decline in industrial production suggests that U.S. manufacturers haven't yet emerged from the year long depression.

"Industrial production is still dead in the water," said Edward Yardeni of Prudential-Bache. "There's still not much strength in industry."

But despite the decline in industrial production, the U.S. economy enjoyed a moderate rebound in growth during the summer with the 3.3% growth in the GNP. However, the pace is substantially below the increase forecasted by the Reagan administration.

The administration forecasted a rebound of growth of about 5% in the final half of 1985. During the first six months of 1985, the growth rate was a dismal 1.1%.

Many private analysts said the country would more likely achieve weak growth of about 2% this year, a rate that some analysts have termed a "growth recession," a time when the economy expands at such a sluggish pace that unemployment rises.

"This is a continuation of the slow and erratic growth we have had since mid-1984," said Chimerine. "The economy is improving modestly but not enough to generate the kind of growth the administration has been expecting."

However, Beryl Sprinkel, chairman of Reagan's Council of Economic Advisers, said that "more and more signs, including a retail sales increase, say that the economy is strengthening and will continue to improve into 1986. The odds are pretty good that real GNP growth will be at the 5% annual rate in the second half as the administration predicted."

Analysts are now predicting growth in the fourth quarter and next year at about 2.5% and 4%, but state that the fundamental problems of the economy are still unsolved.

Gordon Richards, director of economic analysis for the National Association of Manufacturers, predicts growth in 1986 will likely be in the 2% range, although he said he did not see a recession on the horizon.

Chimerine forecasts a growth rate of about 2.5%, down from the administration's target of 4% next year.

"When you take into account the fact that the savings rate is low, the trade deficit is going to get bigger and capital spending is not that good, it is hard to see how you are going to get strong growth," he said.

Americans' savings rate during the third quarter fell to 2.9% of disposable income, the lowest it has been in 35 years.

Also affecting the economic picture for 1986 will be the Reagan administration's plan to lower the value of the dollar., which should boost U.S. exports. But most economists agree that the beleagured American manufacturers aren't likely to benefit from the steps until early 1986.

United States economic indicators

	Feb.	Mar.	Apr.	May	June	July	Aug.
Industrial production	+0.1%	+0.3%	+0.2%	0.0%	+0.3%	0.0%	+0.3%
Retail sales	+1.6%	−0.5%	+3.1%	−0.5%	−1.4%	+0.2%	+1.9%
Unemployment rate	7.3%	7.3%	7.3%	7.3%	7.3%	7.3%	7.0%
Consumer prices	+0.3%	+0.5%	+0.4%	+0.2%	+0.2%	+0.2%	+0.2%
Producer prices	−0.1%	−0.1%	+0.2%	+0.2%	−0.2%	+0.3%	−0.3%
Leading indicators	+0.8%	−0.1%	−0.6%	+0.3%	+0.2%	+0.7%	+0.7%

Raw material outlook

By Patricia K. Pakes, associate editor

While historically the autumn season has been a time of strength for metals, it is unclear whether history will repeat itself. The following is a list of several industrial metals and what their outlook is projected to be, according to the U. S. Dept. of Commerce and Drexel Burnham Lambert.

Aluminum

For the first eight months of 1985, U.S. primary output totalled 2.40 million metric tons, 13.5% less than was produced in the comparable period last year.

Net shipments for the first seven months of 1985 are at an estimated 8,870 million pounds, a decrease of 2.5% from the 9,100 million pounds shipped in the same period last year. Domestic shipments of 8,077 million pounds were 5.1% lower than the 8,512 million pounds shipped in the first seven months of 1984.

Aluminum shipments are expected to increase 3% in 1985 to 16 billion pounds, establishing a record for two years in a row. Aluminum shipments are expected to increase at a compound annual rate of about 3.5% through 1989. The use of aluminum in motor vehicle production should reach about 200 million pounds per vehicle in 1990, from 137 pounds currently.

Copper

After rising 11% last year to a record 7.54 million tons, consumption this year has fallen 3.3%. Primary production was down and worldwide, the market operated in a deficit in the first half of the year.

The prospects for the domestic copper-producing industry are negative. U.S. producers have been adversely affected by the low price levels and have incurred substantial losses. Domestic producers will continue to face costly environmental regulations and competition from foreign producers. In the absence of a significant and sustained increase in price, total production could fall about 15% and primary production could decline about 28% by 1989. Imports are expected to increase significantly and could account for more than 35% of consumption by the end of the decade.

Ferrous castings

With expected increases in output in the automobile and other key industries, ferrous castings shipments are expected to amount to 13 million tons in 1985, an increase of about 4% compared to 1984.

During the rest of the 1980s, growth in the ferrous casting industry will depend on changing production levels and technologies in its user industries. The castings industry must find ways to satisfy the increasing demand for lighter weight, higher performance castings by the auto industry. It must also find new markets lost by substitution of materials, and it must find a replacement market for declining sales of ingot molds as the steel industry moves to continuous castings. With all the above factors considered, shipments of ferrous castings are expected to increase 4% annually, and by 1990, shipments should be about 16 million tons.

Magnesium

Magnesium consumption is expected to increase about 5% per year through 1989 as it continues to replace aluminum in structural applications in the automotive and construction industries. The use of magnesium in die casting offers the largest growth potential in the next few years.

During the first half of 1985, shipments of about 115,700 metric tons represent a 3.5% increase compared to 1984. First half production of 116,100 metric tons is an increase of 3% compared with 1984 first half production of 112,700 metric tons. For all of 1985, demand for magnesium in die casting will total 36,000 tons, up from last year's consumption of 30,000 tons and will increase to about 45,000 tons in 1989.

The areas for signficant growth are steel desulfurization and die casting.

Nickel

Nickel use fell 9% in the first half of 1985 and stainless steel producers report that orders are at their lowest levels of the year.

The high price of nickel this year has led to a substantial increase in stainless steel scrap, especially in Europe. The scrap intrusion has cut considerably into the demand for primary nickel. Worldwide consumption of nickel is likely to fall by about 1% this year, despite a firm first half in which consumption was up about 1% to 2%.

From the 1984 base, domestic primary nickel consumption is forecast to increase about 2.6% a year to about 187,000 tons in 1989.

Steel

In the 1980s through 1984, steel consumption averaged 91.9 million tons per year, compared with 107.9 million tons per year in the previous decade.

Domestic shipments in the 1980s averaged about 75.7 million tons per year compared with 94.9 million tons annually in the previous decade. For the rest of the 1980s, moderate growth in the trend of consumption can be expected, rising to 105 million to 110 million tons by 1989.

Imported steel levels should start to fall sharply over the next six months however, but inventories of previously imported steel will be high enough to make it difficult to significantly increase production before the end of the year.

Steel industry hopes depend on the larger economy, and recent indicators have shown there is likely

to be increasing strength, at least over the next six months.

Steel shipments in the first quarter were 18 million tons and increased to 19 million tons in the second quarter. For the third quarter, shipments are estimated at 17.5 million tons, and for the fourth quarter, shipments are estimated at 18 million tons. At today's prices, the breakeven point is 18 million tons.

The trend in steelmaking toward the use of the electric furnace, ladle metallurgy, continuous casting and specialized high-speed rolling equipment, is expected to continue.

Tungsten

Unless tungsten producers are successful in developing and selling new applications for tungsten, the world tungsten market will lag behind the overall economy. Given the present industry structure, real tungsten prices will creep up very slowly between now and 1990, remaining well below $100 per metric ton unit.

For 1985, the cyclicial recovery in the domestic market seems to have run its course, but consumption levels should be sustained at near pre-recession levels.

Titanium

Total shipments of titanium mill products in 1985 should grow to between 46 million and 48 million pounds, an increase of about 12% from 1984 shipments. Domestic production of sponge should increase to about 21,000 short tons, its highest level since 1981.

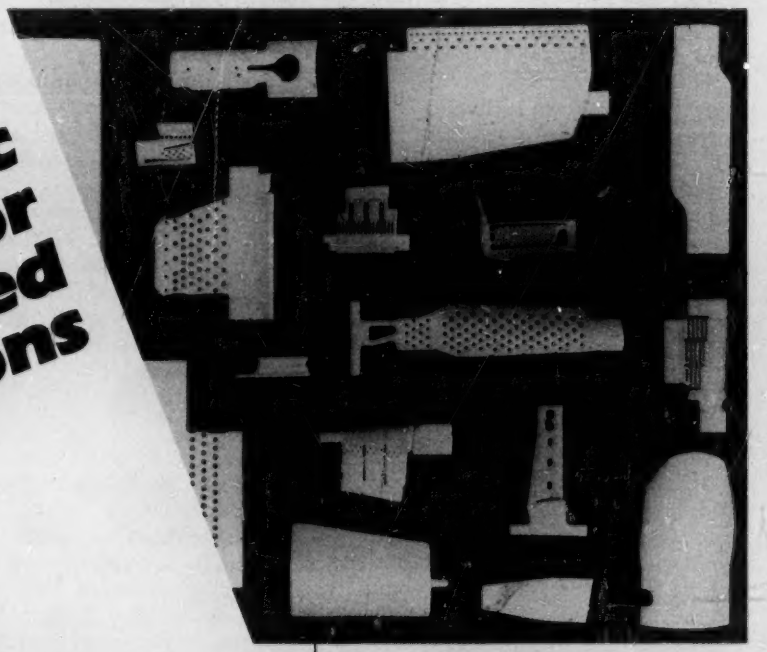
The outlook for titanium mill products through 1989 will depend upon commercial and military aircraft procurement, which accounts for about 70% to 75% of titanium consumption. Over the next 10 years, aerospace will continue to be the single most important market for titanium metal.

Zinc

For 1985, the U.S. Dept. of Commerce expects a 1% increase in slab zinc consumption to an estimated 970,000 tons. Zinc in galvanized steel production is expected to increase slightly to 438,000 tons due to modest growth in demand for corrosion-protected steel products in all consumer sectors.

During the first half of 1985 however, worldwide consumption fell 3.4% while production rose slightly. For the year, zinc in brass is expected to increase to 128,000 tons (up from 127,000 tons in 1984) and U.S. production is expected to increase 8% to 410,000 tons, up from 380,000 tons in 1984.

Galvanized steel will continue to be the single largest application for zinc, growing at about 6% a year for the next five years, although consumption for other protective coatings should intensify.



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Industry reports

By Donald J. Farley & Patricia K. Pakes, associate editors

Die casting

Sales in the domestic die casting industry, influenced largely by the decline in metal prices, will fall from $6.625 billion in 1984 to just about $6 billion in 1985 and are expected to remain at the $6 billion level throughout 1986.

"The industry is facing a lot of unknowns, more so than before," said Peter A.R. Findlay, president of the American Die Casting Institute.

Die casting shipments (1000s of tons)

Metal	1983	1984	1985[1]
Aluminum			
Custom	322	395	380
Captive	259	281	264
Zinc			
Custom	188	178	168
Captive	109	100	108
Magnesium			
Custom	4.5	5.9	6.8
Captive	0.8	1.0	1.2

Source: American Die Casting Institute [1]Projected

"We see a lot of competition coming from overseas suppliers, we don't know what the national economy will be doing and the dollar situation right now is up in the air," Findlay said. "The industry will be doing well to plateau at $6 billion this year and remain at that level through 1986."

Imports will be a problem in 1986, Findlay admitted, adding that the ADCI conducted a study which found that 10% of the total consumption of aluminum die castings is imported. And, if present trends continue, by 1990, nearly 25%, or 493 million pounds, of all aluminum die castings will be imported as imported parts or in imported end products. That figure equals about $1 billion in constant 1983 dollars. Aluminum die castings represent nearly 75% of the entire U.S. die casting market.

continued on page 72

Capital equipment
Die casting machines

According to our survey of die casting machine builders, units shipped during the first half of 1985 are up from the comparable period last year. Shipments are up substantially in the hot chamber machines under 100 tons. Machinery of this type and size are used for die casting relatively small magnesium and zinc parts. Sales data for these machines show a growth in the market for these types of die castings. Of particular interest are orders for cold chamber machines in 1986. Orders for two machines each in the 851-1000 ton and 1001-2000 ton category (both big ticket items) demonstrate a willingness of die casters to invest in capital equipment. Units shipped in 1984 more than doubled those shipped in 1983 for hot chamber machines.

Hot chamber machines (Size in tons of locking force)	Number of units shipped in 1984	Units shipped first half of 1985	On order for 1986
Under 100	36	19	4
101 – 250	4	4	3
251 – 400	7	3	2
401 – 550	1	—	3
551 – 700	5	—	—
Cold chamber machines			
101 – 250	7	3	5
251 – 400	11	11	5
401 – 550	5	2	2
551 – 700	10	7	—
701 – 850	5	1	2
851 – 1000	4	1	2
1001 – 2000	5	—	2

Extrusion

"Cautious" is how three extrusion industry representatives described the industry's outlook for 1986.

"Due to the economy and the uncertainty in the price of metals and foreign markets, the mood in the extrusion industry for next year is cautious with guarded optimism," said Donn Sanford, executive director of the Aluminum Extruders Council.

1986 should be better in terms of sales than 1985, but according to a president of a major extrusion firm, next year will be difficult.

"1986 will be better than 1985 due to the economy and interest rates," said Herbert Schuler, president of General Extrusions Inc., Youngstown, OH.

"But it will still be a difficult year to do business," Schuler continued. "The economy can't continue the way it is. I don't think it can sustain its current level and the deficit, because it is so large, will take a lot of steam out of industries, including ours."

Business in the extrusion industry was good for the first four months of 1985 and year-end 1984 numbers were up from 1983's final statistics. For 1984, end use statistics showed total extruded shapes up by 14.7% compared with 1983. The major increases were in transportation, consumer durables and electrical markets. For the first quarter of 1985, shipments of extruded shapes and tubes increased 4.3% compared with the same period in 1984.

Orders for extruded products are also doing well this year, up about 13.5% compared with 1984. On the negative side however, the import/export market reflected a negative trend. Angles, shapes and section imports in 1984 were up 262.9%, while exports climbed only 7.8%.

Because of the increase in imports, many extruders are looking into new markets and, according to Schuler, successful marketing and the ability to enter new markets will be the key to success in 1986.

"We are making a concerted effort to look into new markets since the traditional ones are shrinking due to imports," said Scott Inboden Jr., general sales manager at General Extrusions.

In an effort to combat the increase in imported extrusions, the AEC hired Arthur Andersen & Co. to conduct an Industry Outlook Study. The study, which will be completed in March, is aimed at determining the future of the extrusion industry, ranging from the potential impact of competitive materials to trends in off-shore assembly of products using aluminum extrusions.

"We've never done a study like this before and we should have," said Sanford. "If we had, I doubt the question of the importance of imports would have arisen. We're redefining the industry since some markets aren't as big as they once used to be."

Other factors expected to affect the extrusion industry include government policies regarding the value of the dollar and a plan to increase exports.

"Driving the value of the dollar down could have a positive impact and could be beneficial to the industry," said Inboden. "The White House plan to increase exports will probably have a long-range effect."

Inboden said he sees an increase of between 5% and 10% in the industry for the coming year with most of the growth coming in the first half of 1986.

The price of aluminum is another factor in the extrusion industry and according to Inboden, it's been a buyer's market and will continue to be one until prices firm up.

"The only way prices will firm up is if the international producers cut back on production or demand increases, but I don't see either of those two things happening," Inboden said.

"What used to be a domestic market for aluminum has now become an international market," he said. "International market prices now dictate domestic prices."

Users of extrusions are closely following the price of the products, Sanford said.

"If a user sees a drop of 20% in the price of aluminum, then he expects the aluminum extrusion to drop 20% in price also," Sanford explained. "Now it's become a matter of educating the users to the industry. Often the cost of the raw material is the smallest part of the job."

Schuler sees the industry consolidating further in 1986, explaining that a substantial number of corporate changes in ownership occurred this year, about 10%, and he expects the trend to continue into 1986.

Capital equipment
Extrusion lubricants

Sales of lubricants during the first half of 1985 are up significantly compared with the same period last year, based on our survey of extrusion lubricant suppliers. The aluminum extrusion industry should have a better year in 1985 than it did in 1984, based on the assumption that the demand for lubricants is proportional to production.

Extruded product shipments (millions of pounds)

	1984	1985
January	207.6	232.4
February	204.6	225.2
March	220.7	240.7
April	209.4	246.1
May	223.0	239.1
June	219.9	237.1
July	207.7	237.7

Source: U.S. Dept. of Commerce Bureau of the Census

Forging

Imports of forgings, and forgings contained in end use products continue to climb. Penetration of these imports into U.S. and Canadian markets for ferrous forgings was 25% in 1982, 26% in 1983 and 28% in 1984. If the estimated value of machined ferrous forgings contained in imported end use products, about 10% in 1984, is added to the 1984 base figure, the result is 38% of the U.S. and Canadian consumed ferrous forged products came from offshore sources last year.

1985's prolonged increase in the value of the American dollar overseas made purchase of foreign goods even more appealing, only compounding problems for the domestic forging industry.

There are no easy solutions to this dilemma. "It's not a case of other countries being more productive than we are," remarks the vice president and general manager of a Western open die forging company. "We have all put a lot of money into our shops over the past three or four years. For the few of us that are in the big open die forging market, there is nobody in the world that has better technology or equipment. Purely and simply, it's the strength of the U.S. dollar overseas, foreign government subsidation and low foreign labor rates. The person that believes we can compete fairly with countries that subsidize their industries and pay $1.20 an hour to their labor force is a fool!"

The Forging Industry Association (FIA) is working with the Metalworking Fair Trade Coalition (MFTC), which consists of 36 metalworking associations, to achieve a fairer, more equitable worldwide trade situation through the Congress. "This Coalition does not ask for, or support protectionism," explains Donald Wheeldon, president of Ontario Forge Corp. and the FIA. "We do support fair trade. The feeling at the MFTC is that existing trade laws are adequate if they were simply applied uniformly and fairly."

The continuing loss of business to offshore producers of forgings is heightening the domestic competitive atmosphere also. In order to subsist in these times, forgers must continually update their equipment and facilities. "I think all of us in the industry are looking at using the latest technological advances that are available and that includes things like greater use of computer-generated information," notes Wheeldon. "Whether it be CAD/CAM use for components, manufacturing information systems for better inventory control or computer use for the actual design and manufacture of forge tooling, I think implementing these techniques is critical to survival."

The North American forger has been hit hard, and there is much uncertainty about what the future may hold. But one fact remains: domestic metalworking industries in general are no longer competing just among themselves for business both at home and abroad. With the emergence of a truly global economy, comes a chance of opening new markets. "Forgers realize that it is a world market in which we are competing," assures Wheeldon. "We have to learn to compete in that market and look for customers and businesses in different areas."

Forging shipments (millions of $)

	Impression die		Open die	
	[1]1984	1985	[1]1984	1985
January	190,188	205,252	45,277	49,921
February	197,071	231,016	47,898	56,132
March	244,620	267,997	52,749	52,483
April	223,801	245,133	50,430	58,623
May	223,801	253,826	46,952	56,896
June	239,415	239,384	59,704	52,329
July	197,778	203,927	34,779	45,325
August	205,585	184,477	54,487	50,397

Source: Forging Industry Association [1]Adjusted

Capital equipment Forging presses, machines and hammers

Sales of forging presses for the first half of 1985 are up from the first half of 1984. The majority of presses shipped during the first half of this year were mechanical, and some hydraulic units are on order for 1986. One respondent indicated that his mechanical presses are of the friction screw types and most of his sales were in the 1000 ton to 5000 ton category.

Forging machine sales were slow in 1984, and picked up during the first half of 1985. Several respondents indicated orders for forging machines in 1986.

No new forging hammers were sold in 1984 or during the first six months of 1985, and no orders for 1986 were reported. Several pneumatic/hydraulic retrofits for existing hammers are currently available. Many of these devices have been sold and as forgers log more time on retrofitted hammers, they are certain to gain more widespread acceptance.

Investment casting

If sales in the investment casting industry increase by 10% in 1986, then the industry will be doing well, says Henry Bidwell, executive director of the Investment Casting Institute.

"The industry will continue to grow, but at a lower rate than before," says Bidwell. "It's quite likely that people will be cautious in 1986 because they don't have a feel for what is happening in the economy."

The gross national product has been increasing slowly and Bidwell says that that will have some effect on the investment casting industry. He also added that some firms are looking into mass production and thinks it is a very real possibility.

"Business was fairly busy in 1985," he says. "People were changing their marketing and consolidating into larger groups looking for long-run orders. The factories have been fairly full, indicating that things aren't getting any worse."

The aerospace and defense end of the industry has been "fairly good" Bidwell says, noting that it has had its up and downs, and predicts that the market will be fairly strong for those who produce quality castings for aerospace and defense.

As for the commerical end of the industry, Bidwell says that those casters with a wide customer base will be the ones who will do very well next year.

But the vice president of manufacturing for Stainless Foundry and Engineering in Milwaukee, WI, isn't so sure.

"The commerical end of the market is at a plateau," says E.K. Zielke. "We're anticipating a little increase in sales and then it will hold its own. Aerospace should show an increase. Overall, the industry should do a little better in 1986 than it did this year."

Imports pose a major problem for the industry. Historically the import problem has been severe, especially when there was a "crunch" in the 1970s.

"The import situation confronting our industry could get worse," Bidwell says. "We see an increase in the companies from Europe and the Far East. But it will depend on the cases. Right now we're waiting in the wings, particularly in the automotive field."

The smaller companies will be the ones facing difficult conditions from both the East and West, says Bidwell.

Zielke also expressed concern over the import situation, stating that he has heard some real "horror stories" from other firms in the industry.

"We're being cautious about foreign compeition," he explains. "It's hard to compete with some of the pricing. I've heard some real horror stories and that's one reason why people aren't investing in capital equipment. It's kind of a tender area."

Imports are part of the reason why Zielke sees no tremendous growth in the investment casting industry next year, but sees it holding its own thoughout the year.

As in other metalworking industries, investment casters are looking into new markets and are continuing efforts in research and development.

"People in the industry are beginning to look into new markets on an ongoing basis," says Bidwell. "Some of the traditional markets are disappearing, like the oil equipment. In the last recession, that industry bottomed out and some of our firms suffered."

Zielke added that the industry must continue projects in research and development. "We as an industry must stay on top in order to compete with foreign castings and to stay ahead and develop new applications."

Investment casting is unique in that it lags behind the economic indicators and picks up when the indicators are down, says Bidwell.

"Generally speaking, the industry is about 180 degress out of phase with the normal leading indicators," he explains. "By nature, we have to expect orders in advance and have to manufacture the dies. We tend to pick up our business when others are coming down."

Overall, the future of the investment casting industry seems to depend on successfully improving technology and successfully marketing the investment casting industry.

"The industry has a good future and it is very competitive," says Zielke. "With improved technology we will be the ones that are around. If we don't improve technology, we can expect a falling out. The future of the foundry industry depends on technical advances."

The industry is constantly looking into the automation of patterns and pattern assembly, adds Bidwell, saying that the critical area is finishing. A lot of parts can be mass produced and need to be, he adds.

"I do expect the industry to grow," he explains, "though where we are now is where we should have been about 25 years ago."

1986 won't be a significant year in the investment casting industry, but it will be better than 1985. The industry has experienced a downturn in bookings related to housing a year ago, but sales should increase about 10% over last year.

Capital equipment

Investment casting wax injectors and extruders

Investment casters are making more use of wax extruders for making patterns than wax injectors, according to our survey. Respondents indicated that the sale of wax extruders for the first half of 1985 are up from the same period a year ago. Wax injector manufacturers shipped a large number of units in 1984, but shipped only a small number of injectors during the first six months of 1985.

Powder metallurgy

Rapid solidification technology, EMI shielding, P/M hot forging and metal injection molding are developing P/M techniques that will make the industry at home in today's high technology arena. In combination with an increasing use of metal previously unknown to the industry such as stainless steel and aluminum, P/M is taking a giant step up from the conventional press and sinter technology.

However, even with this bright future in new techniques and materials becoming more of a reality, the industry must still contend with many of the current problems hurting other metalworking industries as well. "At the risk of oversimplifying what is a very complex scenario, confused by the strong dollar abroad, eroding markets due to overseas competition, the cost of borrowing money and so on, it seems that our industry is currently operating in a 'two-tiered economy'," states Kempton Roll, executive director of the Metal Powder Industries Federation (MPIF). "Those doing business with the automotive industry appear to be riding along very nicely. Since this is, after all, the major consumer of metal powders and P/M products, far greater than all the other markets combined. It seems to be keeping the whole industry's head above water."

Powder shipments for P/M parts (1000s of tons)

	1980	1981	1982	1983	1984	[1]1985
Iron powder	116	134	111	154	183	165
Copper and copper base powder	16	19	14	18	21	17

Source: Metal Powder Industries Federation [1]Projected

Auto downsizing and the urge for more efficiency will continue to open up new potential for P/M parts in automobile engines, chassis, transmissions and accessories.

Another encouraging sign for the automotive P/M market is the growing use of P/M forging. According to Roll, one major American car maker is now committed to using P/M forged connecting rods and also plans to dedicate a facility to the manufacture of P/M camshafts. Both new products are scheduled to appear in 1987 models.

The other tier Roll speaks of, P/M markets other than automotive, are finding business slow and uncertain. For instance, growth in business machines has been stagnated by the loss of market share due to imported machines, especially the copier.

Foreign competition in conjunction with an unsettled economy, has also eaten away at P/M farm machinery and hardware markets. This decline can be seen in MPIF projections for 1985 iron and copper powder shipments.

A recent downturn in some markets other than automotive has not stopped the industry's move toward diversification though, and for good reason. "The home building and construction industries have benefited from recent reductions in the cost of borrowing money. When money is cheap and mortgage rates low, more houses are built, more appliances and hardware items are purchased and more P/M parts are manufactured," relates Roll.

"Power tools have clearly come of age for us. There was a time when power tool makers would not admit to using P/M parts in their product. Today they not only admit it but are becoming increasingly dependent on powder metallurgy to enable them to compete, not only with one another, but with all those other power tools and related machinery coming in across our borders," says Roll.

Many other reasons for optimism come into play when looking to the future for the P/M industry. A new P/M materials standard (#35) was adapted this Spring by the American Society for Testing and Materials (ASTM).

Awareness in the process of P/M

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Capital equipment P/M compacting presses and sintering furnaces

P/M part producers use more mechanical presses than hydraulic presses, according to our survey. As the table shows, 31 presses were shipped in 1984 and only one hydraulic press was shipped. The number of presses shipped during the first six months of 1985 is up slightly from the same period in 1984, but mechanical presses outsold the hydraulic units by two to one.

P/M part makers prefer electric over fuel-fired sintering furnaces, according to our survey. Sintering furnaces sold during the first half of 1985 are all electric. Units shipped during the first half of the year are close to the total number of furnaces shipped during all of 1984 and respondents show a substantial number of electric furnaces on order for 1986.

Compacting presses (by type)	Units shipped in 1984	Units shipped first half of 1985
Mechanical presses	31	6
Hydraulic presses	1	3

Roll forming

The state of the roll forming industry seems to reflect that of the general economy —strong but growing at a slower rate than one year ago. A diversified base of customers involved in such industries as automotive, aerospace, construction, machinery, shelving and others, is what ties the industry closely with the general economy while offering many custom roll formers the security blanket of relying on many varied industries rather than just one.

Of the roll formers that don't believe their sales are very decent, few are suffering with extremely low sales. "Some may not be at capacity, but they are still comfortable," reports Robert Boeddener, president of the Custom Roll Forming Institute(CRFI).

A 5-10% growth in sales over 1984 is the prevailing condition of most roll formers. However, even with shipments up, few roll formers are looking for a significant increase in 1986. "We don't see great times for 1986, just good," said one roll former at the CRFI Annual Institute Meeting held in Cleveland, October 16th.

It appears as though escaping implementation of modern manufacturing techniques, especially for the large roll former, will be difficult if one is to compete for significant sales in the next few years. Some roll formers, such as Superior Roll Forming Co., Cleveland, OH, have already started on modern manufacturing integration. John Synk, president of Superior, relates, "We are using different methods of feeding material into the mill and investigating different methods of creating net shape parts. CAD/CAM may not fit into what we are doing yet, but we are using some computer techniques in length control. We are also looking at robotics for some handling and secondary operations."

Some of the same problems that have plagued the custom roll former for several years, will continue along with some new issues that have the potential to become quite hazardous. "If there is one problem the custom roll former is constantly facing, it is finding qualified help," observes Boeddener. This holds especially true in the area of tool & die making, and will most likely will continue in 1986 as well.

Another current industry problem stems from the sale of poor quality raw materials, or "funny steel" as one roll former referred to it, which is on the rise. The concensus among roll formers seems to be that these poorer quality materials are supplied from large mills rather than steel service centers. In retaliation, some roll formers are purchasing the majority of their metal overseas where high quality material is consistantly supplied as opposed to that supplied by domestic mills.

Short runs which, "keep you busy but don't really make you money," as one roll former put it, and short lead times are growing hardships for many metalformers. "People are constantly trying to push their inventory on someone else, so the tendency goes toward short orders," reports Boeddener.

Imports may prove to be the "sleeping giant" of the custom roll forming industry. Rarely discussed now, the potential for loss of business in the near future is there. "It is not imports in the conventional sense, it's instant worldwide capability of transmitting drawings, making proposals and getting responses," says Boeddener. "In other words, a company on the other side of the globe can now compete as easily as the one next door because of modern communication capabilities.

"Roll forming tends to be a little import proof by virtue of it being custom to a particular application and therefore requiring a close liason between the supplier and the buyer," continues Boeddener. "However, modern communication techniques are changing the definition of closeness."

Capital equipment
Roll forming machines

Business is looking good for the roll forming industry. Respondents to our survey of roll forming machine manufacturers showed a substantial upswing in machines shipped in 1984. Most of the increase is in the 21 to 25 roll station category, implying a trend toward more complex roll formed shapes. The number of units shipped the first half of 1985 is up significantly compared to the same period last year. The same holds true for machines on order for 1986. One respondent (not included in the data) said he is expecting to ship eight 16 to 18 roll station lines in the second half of 1985 and one line with 26 roll stations.

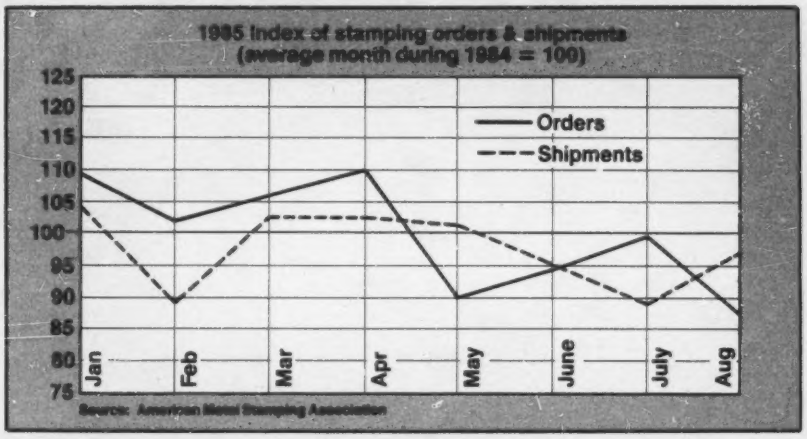
Machines (by number of roll stations)	Units shipped in 1984	Units shipped first half of 1985	On order for 1986
5 - 8	64	49	—
9 - 12	62	39	19
13 - 15	35	21	13
16 - 20	37	38	19
21 - 25	41	13	7
Over 25	24	21	4

Stamping

The stamping industry has seen a fairly uneventful year in 1985 in terms of growth or decline of business activity. "All and all, the business level is adequate," states Jon Jenson, president of the American Metal Stamping Association (AMSA). I think we have plateaued now, and the remainder of the year should be pretty flat. We are down from 1984, but only slightly. This can be attributed to a reduced surge in the economy and continuing erosion from overseas shipments."

The high value of the American dollar in foreign markets is also playing a part in business loss, but the real threat here continues to be imports. A decline in import shipments is not forseen by Jenson due to low foreign labor rates, particularly in the Pacific basin, and the fact that there is no duty placed on products coming into this country from these sources.

Few in the metalworking field believe protectionism is a realistic avenue for fighting imports. AMSA is no exception. According to Jenson, the laws for fair trade, which AMSA supports, are already on the books. It is simply a matter of enforcing them. "We feel fair trade is a situation whereby each nation can take advantage of its competitive strengths in a world market without the intrusion of government in the form of upstream subsidies, and without the artificial tariff trade barriers. What we have now are companies in this country competing against governments abroad with restrictions thrown in also."



Imports are just one of the factors contributing to this country's shrinking industrial base. The downsizing of the American automobile and an increasing percentage of our gross national product made up of services rather than manufacturing monies are other important factors.

In order to maintain economic stability as these changes occur, the stamping industry will have to make some adjustments itself to become more flexible. In the future, runs will be shorter, inventory will be lower, setups will have to be faster and, therefore, stampers will have to place more responsibility in the hands of the equipment operator. The company that is specializing in extremely long run production of a single item is going to find that the demand for high volume is going to decrease. There will be market opportunities in somewhat smaller quantities which will pay a premium for quick die change and the production of just a few parts. "This means there will be kind of a blending of the industry from the ultra-high

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Capital equipment : Stamping presses

Mechanical presses (by tons force capacity)	Units shipped in 1984	Units shipped first half of 1985	On order for 1986
1 - 10	—	1	—
11 - 50	120	72	—
51 - 100	110	61	—
101 - 500	89	38	10
Over 500	13	9	7
Hydraulic presses			
1 - 10	4	3	—
11 - 50	19	6	—
51 - 100	2	—	—
101 - 500	3	—	—
Over 500	—	—	—

Stamping presses shipped during the first half of 1985 are above the levels reported for the same period in 1984 for mechanical presses, but are below the levels for hydraulic presses. Not shown in the data was a respondent who makes pneumatic presses. In 1984, he shipped eight presses in the 1 ton to 10 ton category, 44 in the 11 ton to 50 ton range and six in the 51 ton to 100 ton range. The number of units shipped by this manufacturer during the first half of 1985 are equal to the number of units shipped during the first half of 1984.

End use markets

By David Veit, consultant

Aircraft & Aerospace

The international character of the aircraft industry and the pressing technical demands for improved performance have shaped a highly successful and competitive group of U.S. aircraft component suppliers. Shipments of forgings, investment castings, stampings, extrusions and other engine and airframe components from U.S. companies are used in building aircraft in many parts of the world, a trend which many see accelerating.

Figures from the U.S. Department of Commerce through July 1985 show an increase in U.S. aircraft shipments of 18% compared to the previous year although new orders are off by 3%. According to an official at the Aerospace Industries Association, a more important indicator of the health of the industry is the pipeline of unfilled orders which have risen steadily since 1981. Unfilled orders were up about 6% for the year ending July 1985. Total unfilled orders then were $122.6 billion, compared to $8.7 billion in 1981.

Standard & Poor's survey of the aerospace and air transport industry reported in August that deliveries and orders for the first half of 1985 support the view that the commercial air transport business has reversed the slide of the early 1980s and is embarked on an upward trend that should continue for several years. According to the S&P analysis, Boeing and McDonnell Douglas, the two domestic builders of large transports, will build a total of 272 aircraft in 1985, compared to 192 in 1984.

The S&P analysis refers to a Boeing market forecast of a number of factors that will stimulate an estimated world market of about $135 billion for fleet growth and replacement over the next decade.

Likewise, investment in plants and equipment by the aerospace industry has stabilized at a high level of 6.8% of sales. This is regarded as a healthy and sustainable level after a boom in plant investments as high as 13% of sales in the early 1980s, due largely to tax incentives.

A market forecast composited from a variety of data and sources by The Freedonia Group, a Cleveland-based market research organization, places 1985 aircraft and parts shipments at $76.4 billion, rising to $83.2 billion in 1986 and to $160 billion by 1995. Missiles, space vehicles and parts during the same period are expected to rise from $20.4 billion to $58 billion.

Among trends which have come to light in discussions with industry executives are several that will affect the future use of metal components for aerospace. These include a broadening of international markets, the replacement of metal airframe skin and structural elements with composites, the recent upswing in titanium as an airframe material, greater efforts to achieve economies by near net shape designs, and the introduction of more sophisticated testing procedures by engine builders.

Asked whether the current rash of aircraft crashes might affect the design of components or the specification of materials, the unanimous feeling was that none of the incidents were a result of component failure, but could be attributed to airline maintenance problems or human error. However, in an industry where quality control is already a central consideration, there seems to be heightened awareness of the continued and intensified attention to quality control in every phase of production.

The aircraft industry always has been international in character, but a worldwide "explosion" of aerospace activity was mentioned by a number of sales executives as giving the U.S. parts suppliers new opportunities for expansion.

Where customers once were located primarily in the United States, suppliers now find themselves dealing with partnerships and consortiums across many national lines, such as the partnership of General Electric and Rolls Royce to build two models of engines. General Electric also is combining with Snecma in building another engine competitive with the GE-RR engine,and Pratt & Whitney is involved with Rolls Royce and five other companies to produce the new B2500 engine.

In the meantime, business is proceeding in Europe, Japan, Brazil and Spain for forgings, and Australia is expected to enter the market within the next two years. Five years is the time frame for the possible opening of the Chinese market for U.S. forgings.

Michael Gumma, director of marketing and international sales for Wyman-Gordon Co., says his company actively is serving many of these markets.

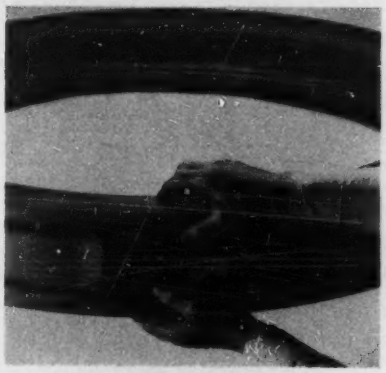
The process and material developments used at Wyman-Gordon to meet the increasingly sophisticated requirements of both domestic and offshore customers in-

clude a new ring rolling process and an increase in the use of titanium.

The company's Reisner Metals facility in California developed a ring rolling process which can distribute raised pads or bosses around the perimeter of a rolled ring. This saves hours of machining time and loss of expensive metal when large areas on the outer surface of the ring previously had to be hogged out to form a small boss or pad on which to mount a starter. The company has produced development quantities of these rings up to 40 inches in diameter, and expects the process to be in full production before the end of the year.

While this process can compete with investment casting, the investment casters have their own developments that offer properties comparable to wrought and forged metals: the use of hot isostatic pressing or single crystal castings. This type of technical competition will continue to raise the quality while restraining the cost of complex components.

A renewed interest in designing titanium forgings airframes is becoming a significant trend, says Gumma. Boeing, which had designed most titanium out of the airframe of the 757 and 767, has reinstated it in the new version of the 737. An increase, and therefore more dependable, supply of this metal at an acceptable price makes the high strength, low weight material increasingly attractive to the aerospace community.



This Ti6AL-4V seamless rolled ring was produced by Reisner Metals Inc., part of Wyman-Gordon Co.'s Aerospace Group, using a new process to form integral external bosses. The new ring rolling process helps reduce material waste

The old saying, "Test bars don't fly, airplanes do," is one reason aircraft companies have introduced tests that simulate performance of parts in the engine under operating conditions. A cycle fatigue test, for example, takes the component through a complete cycle from warmup, starting at ambient temperature, to the operating temperature of the section of the engine (which may be as high as 2000°F), measuring and analyzing temperature gradients and performance at all stages.

This intimate knowledge of part performance under operating conditions enables the customer to specify whether the part is to be forged on a hammer, cold die or hot die, and what temperature will give the required microstructure and properties. As Gumma says: "We have equipped ourselves to do any or all of these. If the customer thinks a hot die run at 1600°F will give the quality he needs, we are ready to do it."

This company's 8,000-ton isothermal press features microprocessor control of the forge furnace and die temperatures which automatically respond to more than 50 process variables. This contrasts with part designs which once relied entirely on standard, static test results, and in keeping with the greater sophistication and understanding of metal performance during operation. It also requires more equipment and process controls by the forger.

Joseph Shiel, vice president for sales and marketing at Howmet Turbine Components Corp., is also optimistic about the potential for growth in the market for aerospace investment castings, such as those produced by his company. The advanced level of technology, he says, comes from customer push. "They're always looking for something that is lighter, stronger and can runhotter," says Shiel. The result is a program at Howmet to produce thin-walled investment castings to meet market needs.

As Shiel recalls, when he entered the industry many years ago, the largest investment casting could be held in the palm of one's hand. Now turbine rings can be cast that are more than five feet in diameter and castings of almost unbelievable complexity are commonplace. The investment casting industry, as he sees it, is on the threshold of its greatest period of expansion and capability.

Howmet, whose basic investment casting business has been related to airfoils, has expanded into related areas of coatings, ceramics and hot isostatic pressing which complement its aerospace castings and increases the company's growth potential.

European markets are very attractive and although there is

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Costs of some precision metal products consumed by the aircraft industry (in millions of $ delivered cost)

Process and material used	1977	1982	(est) 1986
Castings, rough and semifinished (steel)	5.5	3.8	5.8
Castings, rough and semifinished (aluminum)	34.2	39.7	60.7
Extrusions (aluminum)	63.2	83.4	127.6
Forgings (steel)	27.9	15.5	23.7
Forgings (aluminum)	45.5	63.6	97.3

Sources: U.S. Census Bureau, TFG Composite Forecasts

Circle 76 ⟶

Appliances

The record-setting pace of the U.S. appliance industry is expected to continue in 1986. The Association of Home Appliance Manufacturers (AHAM) projects 1985 shipments of major appliances will be 41.2 million units, almost 2 million units more than the record set in 1984. For the first eight months of 1985, total shipments exceeded last year's pace by 5.8%, well ahead of the growth of the gross national product and other economic indicators.

Imports of major appliances have had relatively little impact on the market so far. Less than 5% of the larger appliances are from offshore sources, says Paul Roman, vice president of marketing for AHAM. Some imported room air conditioners are beginning to hit the U.S. market in addition to small sized washers and dryers and small refrigerators. Microwave ovens are the only major appliance being imported in any significant volume.

Although the trend for appliance manufacturers to take their facilities offshore is not significant yet, one major manufacturer of air conditioners is reported to be moving all manufacturing from the United States to Brazil.

In addition, the Sunbeam Corp. has closed six U.S. manufacturing plants in the last three years due to high costs. Charles Keller, director of advanced manufacturing engineering for Sunbeam, said that today microwave ovens, hair dryers, curling irons, food processors and other appliances are made in the Far East and represent a lost business opportunity for U.S. suppliers, especially in the die casting industry.

A trend toward the purchase of die castings from foreign sources appears to be on the increase. Lower finished piece prices and acceptable quality levels may influence some major appliance builders to take a closer look at offshore sources as cost pressures increase. Lower foreign tooling costs may also be a factor to contend with.

But despite the competition from foreign producers, 1986 is expected to provide further gains for the appliance industry due to lower interest rates, a steady increase in new residential housing starts, strong consumer confidence and stable employment.

The value of appliances shipped in 1985 will total $18.1 billion, compared to $16.7 billion in 1984, and is expected to rise to $19.7 billion in 1986 and to $35.1 billion by 1995, according to data available from The Freedonia Group (TFG), a market research organization.

Changes in material specifications over the next several years may have the greatest impact on shipments of die castings, as chromium-plated plastics may find their way into ranges and refrigerators, replacing zinc die castings.

A special air vent hole pattern for a roll formed range frame provides much the same amount of air movement as much larger holes or slots while giving the vented area the feel of a non-interrupted surface for safety purposes. The part is roll formed by Pyramid.

Costs of some precision metal products consumed by the appliance industry (in millions of $ delivered cost)

	1977	1982	(est) 1986
For household ovens and ranges			
Metal stampings	27.5	29.7	45.7
Castings (iron-gray and malleable)	.8	N/A	1.5
Castings (aluminum and aluminum-based alloy)	6.6	41.7	64.2
Castings (zinc and zinc-based alloy)	N/A	.2	.3
For household refrigerators and freezers			
Castings (aluminum and aluminum-based alloy)	8.3	N/A	15.2
Metal stampings	25.8	N/A	47.1
For household washers and dryers			
Castings (iron-gray and malleable)	17.6	25.8	39.7
Castings (aluminum and aluminum-based alloy)	17.6	17.7	27.3
Castings (zinc and zinc-based alloy)	7.4	4.8	7.4
Metal powder products	1.6	7.6	11.7

Note: These totals do not include captive producers
Sources: U.S. Census Bureau, TFG Composite Forecasts

Automotive

While major automobile manufacturers have achieved profitability by using ingenuity in manufacturing and sales, some of the steps they have taken to remain competitive are having a profound effect on traditional materials and sources of supply.

Like the aircraft industry, the demand for lighter, more energy efficient materials and the internalization of the auto industry, are influencing what types of metals and components are being designed and what sources are being used. But in contrast to the aircraft industry, the builders of automobiles must satisfy millions of individual buyers of the end product in terms of cost, performance, style and service.

While the total sale of cars and trucks is expected to increase through the rest of the decade, that does not necessarily imply that companies selling materials or services to the industry will also increase sales. They will have to make substantial improvements in productivity, technical competence and delivery to maintain a significant share of the growing market.

1985 projected sales of about 10 million cars and about 4.6 million trucks represent the highest sales volume in several years. A spokesman for the Motor Vehicle Manufacturers Association indicates that the sales volume in 1986 is expected to be about the same.

Industry sources suggest that changes in the use of steel, aluminum and zinc will be minor. At Ford, a new forged aluminum drive shaft in the Aerostar van, and at General Motors, a new lost foam cast aluminum cylinder head, may be small indicators of an increase in aluminum usage forseen by many.

The need to reduce weight to meet fuel economy regulations may result in the replacement of some cold rolled steel with high strength, lighter weight steel. With a penalty of five dollars per car for every tenth of a mile the manufacturers miss the target, there is strong incentive to decrease the weight.

It will definitely favor greater use of plastics, and one expert in the aerospace industry sees the automotive industry as the ultimate greatest user of composites for body sheet and structure, chassis and suspension, drivetrain and engines. These materials, according to the National Aeronautics and Space Administration (NASA), are about one-sixth the weight of steel and half the weight of aluminum, while exceeding both in modulus of elasticity and strength.

Weight is one of the many factors which will have to be met. Although the Cleveland-based research organization, The Freedonia Group (TFG), projects sales of 12.4 million automobiles by the mid-1990s, it also indicated that 40% of these will either be imports or made in production/assembly units built in this country by Japanese firms. Custom suppliers of metal parts believe that Japanese manufacturing facilities in this country will continue to bring in most components from offshore sources, or will cause Japanese parts suppliers to set up plants in the United States.

So while TFG projects an increase in automotive dollar volume from about $195.5 billion in 1985 to $405 billion in 1995, downsizing, foreign sources and competition from other materials will result in a smaller market for the U.S. producers of die castings, stampings and other components.

A notable exception to this may be the powder metallurgy industry. "Downsizing and the urge for more efficiency continues to open up the potential for powder metallurgy engines, chassis, transmissions and accessories," says Kempton H. Roll, executive director of the Metal Powder Industries Federation.

"Many of the metal components previously forbidden to us because of size or stress levels are now well within our capabilities because they are smaller," Roll says. "Even though the stresses might be the same,we are more capable these days of meeting higher, property levels than we were a few years ago."

In support of his statement, Roll refers to a major American car manufacturer committed to production of P/M forged connecting rods, and plans of the same car builder to devote a facility to the production of P/M cam shafts. Both are scheduled for 1987 cars.

He also noted another major U. S. auto builder that decided to develop more than 30 P/M forged parts for a new product line, in addition to a large number of conventional P/M parts for the same car.

"Despite the potential volume of these new applications," Roll explains, "we see no concern for raw material availability. Capacity for iron powder and copper powder production far exceeds current and anticipated near-term demand."

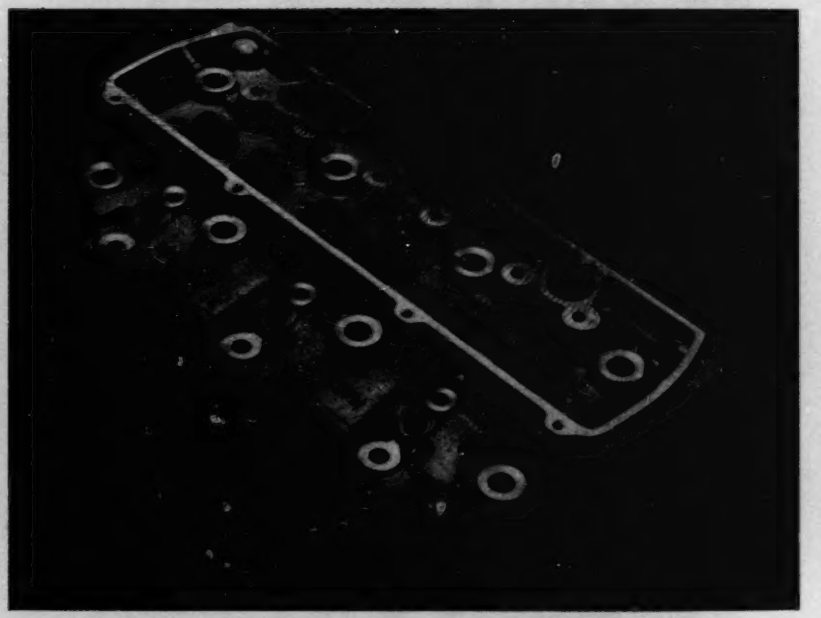
The American die casting industry faces a different set of challenges in its effort to hang onto what has been its biggest customer since the auto industry and the die casting industry grew up together.

Figures cited by the American Die Casting Institute indicate that shipments of aluminum die castings by custom producers will grow from 248.7 million pounds in 1983 to about 290.2 million pounds in 1990, with an increasing number of design applications and a larger number of automotive units.

Likewise, custom-produced magnesium die castings will show an increase. Starting with a low volume of about 4.4 million pounds in 1983, the light weight metal is expected to reach a total of 12.2 million pounds by 1990. If one or two large components, such as transmissions or clutch housings, should be converted to magne-

sium, the volume of magnesium use could more than double. Development of the high purity, corrosion-resistant alloy, AZ91HP, may help gain acceptance.

Not only have die casters been responsible for part of the reduction in zinc die cast tonnage by developing sophisticated methods to produce thin-walled zinc die castings with lower cost and improved properties, but there has also been a cutback in the amount of chromium-plated die cast trim which previously accounted for a big part of the industry's output. Molded plastic replacement of die cast zinc grills and instrument panels, once the showpieces of the industry, is another side effect of smaller car sizes.



The Central Foundry Division of General Motors will begin producing aluminum cylinder heads for gasoline engines for the 1987 model year. The heads will be made with the "Lost Foam" process, formerly used to produce the Diesel head pictured. Casting weight and machining requirements are expected to be lower than other casting processes.

Costs of some precision metal products consumed by the automotive industry (in millions of $ delivered cost)

	1977	1982	(est) 1986
For car bodies			
Extruded shapes	N/A	23.1	31.8
Castings (iron-gray and malleable)	N/A	385.5	531.9
Castings (steel)	60.4	43.7	60.3
Forgings (iron and steel)	N/A	78.7	108.6
Metal powders (for parts)	56.8	76.9	106.3
For truck and bus bodies			
Castings (iron-gray and malleable)	2.1	0.9	1.61
Castings (steel)	1.4	0.6	1.07
Castings (aluminum and aluminum-based alloy)	.7	1.4	2.04

Sources: U.S. Census Bureau, TFG Composite Forecasts

Yet even in this new area, some specially-equipped and skilled custom die casters have enjoyed a very stable market for their services, especially as the panic over gasoline shortages has dissipated and Americans are renewing their love affair with larger, more luxurious cars.

Joseph Germy, vice president of sales and marketing for Woodstock Die Casting, a manufacturer of plated zinc die castings, says that business has picked up in the past two years and he expects a continuation and increase in 1986 and beyond. He credits the increase to two trends: more people buying larger cars now and those who do, replace them more frequently. Woodstock produces plated die castings for such top of the line cars as Lincoln Continental, Cadillac and Buick, as well as structural castings like flywheels and distributors for a broader market. Automotive represents about 50% of the company's volume.

According to figures released by Dale C.H. Nevison, president of the Zinc Information Center, weight of zinc die castings in the typical 1985 U.S.-built automobile settled at an estimated 20.2 pounds, a 1.5 pound drop from 1984 models. Five years ago, the total was 25.0 pounds of zinc die castings in the average car.

A big part of the automotive market, sometimes overlooked when examining shipments, is the automotive aftermarket. Paul Mosser, vice president of marketing for Target Stamped Products Corp., says his firm produces deep drawn stampings for automotive parts, but mainly for aftermarket products. His company has enjoyed a steady volume of this business and reports little direct impact from offshore sources, except as components of complete products shipped into this country. A trend which Mosser notes is an increasing demand from customers for technical assistance and expertise.

Office equipment

The business equipment and data processing industries appear to be on a steady upward course, despite news during recent months of layoffs and production cutbacks in the semiconductor industry.

Revenues of these industries are expected to increase by 8.2% from $21.4 billion in 1984 to $23.1 billion in 1985, according to projections by the Computer and Business Equipment Manufacturers Association (CBEMA). Sales of data processing equipment and services are expected to rise from $127.1 billion in 1984 to $141.7 billion this year.

Some of the individual segments for which CBEMA provides analysis include electronic typewriters, for which a substantial rise of 30% to $1.2 billion, is projected. Office copiers are expected to increase 9% to $4.6 billion, with most of the growth accounted for by plain paper copiers.

In the computer field, the largest and fastest growing segment is software and related services, projected to be up 15.5% to $40.7 billion in 1985. The hardware segments show less activity. Mainframe shipments will stay at the 1984 level of about $10.5 billion, while microcomputer and minicomputer sales will gain at about 10% to 11% in 1985.

The long-term prospects for the data processing industry are good as the economy continues to evolve into an information-intensive society. Shipments of office and computing machines, according to The Freedonia Group, a Cleveland-based research marketing organization, are projected to reach $227 billion in 1995.

Lura Romei, editor of Modern Office Technology magazine, says new tools are needed to handle the heavy volume of work in modern offices, and that much of the business equipment now being used is obsolete. Second generations of copiers, word processors and other equipment, with increased capabilities for graphics, printing and mailing, are taking their place in the new automated office. She sees a steady growth in demand for these new products through the rest of the decade.

This point of view is shared by some suppliers of components for office equipment and data processing hardware. Donald Battis, vice president of sales for The Kingston-Warren Corp., a roll former which serves computer manufacturers, reports that although there has been some slowdown in established product lines, there are some bright spots in new product lines where there is an initial flurry of tooling and production followed by pipeline fillup at sales outlets.

While there is no assurance of future sales volume, Battis believes that computer manufacturers are pushing hard on new equipment, with good prospects for success. The mechanical aspects of computer design, of course, do not get the emphasis that is given to electronic design, but missionary work among the mechanical engineers is showing them how roll forming can contribute to their products.

The die casting industry also sees computers, copiers and word processing machines as a potential growth market. According to the American Die Casting Institute data, custom produced aluminum die castings will reach a total vol-

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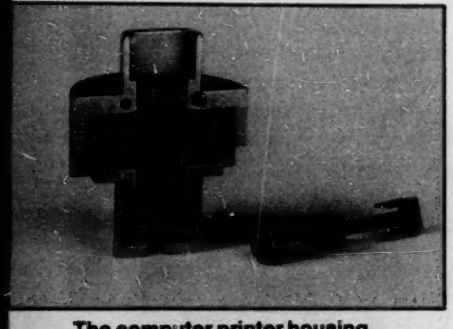

The computer printer housing (left) and hammer are injection molded by Multimaterial Molding Inc. out of nickel steel.

Costs of some precision metal products consumed by the office equipment industry (in millions of $ delivered cost)

	1977	1982	(est) 1986
For computers			
Castings (iron-gray and malleable)	N/A	27.4	43.5
Castings (steel)	18.8	44.8	71.2
Castings (aluminum and aluminum-based alloy)	39.5	104.4	165.0
Castings (copper and copper-based alloy)	N/A	1.5	2.3
Castings (other nonferrous)	N/A	8.6	13.6
Metal stampings	67.4	92.4	146.0
For other office machines			
Castings (aluminum and aluminum-based alloy)	19.1	9.3	14.8
Castings (iron-gray and malleable)	N/A	2.3	3.7
Castings (steel)	4.1	11.3	18.0
Extruded aluminum shapes	3.0	3.5	5.6
Metal stampings	37.5	26.3	41.8

Sources: U.S. Census Bureau, TFG Composite Forecasts

Other markets

Shelving/ merchandising

In 1986, U.S. vending machine producers are expected to ship about 500,000 coin-operated units worth more than $500 million, according to a *Precision Metal* /Penton Research forecast.

Strong competition from metal substitutes is expected to continue in the industrial storage marketplace, says Louis Rafetto, general product manager at Penco Products and chairman of the Pittsburgh-based Shelving Manufacturers Association.

While shelving producers continue to use steel in shelf uprights and braces, more are substituting wood and particleboard in the shelf portion of the assembly, says Rafetto.

Energy exploration

1986 will be a difficult year for oil and gas drillers, says George Romano, vice president of marketing for Gulf Forge Co.

Toward the end of next year, Romano projects that there may be increased orders for drilling rigs as units shipped in the last banner sales year, 1981, reach the end of their useful life. Depending on what tax plan Congress approves, better prices for oil and gas and tighter gas supplies may be seen in 1987 or 1988, says Romano. This could lead to increased drilling in the industry.

Casters, forgers, and makers of powdered metal parts are expected to do about $700 million worth of business with oil field machine producers next year based on the latest Census Bureau consumption tables and The Freedonia Group (TFG), a Cleveland-based market research organization, forecasts.

Commercial and industrial construction

Commercial and industrial building is headed in several directions as 1985 draws to a close, according to the latest "Dodge/ Sweet's Construction Outlook." While industrial building construction has stalled, contracting for stores and shopping centers is strong, due to the booming residential market.

High vacancy rates around the country and uncertainties about Congress' tax reform package are keeping the office construction market soft, especially for high-rise projects. The value of commercial and manufacturing contract construction and other nonresidential structures could be 4% higher in 1986 than in 1985, according to (TFG).

Metal building system sales parallel the total construction marketplace, according to new figures from the Metal Building Manufacturers Association. The association is made up of 27 building systems manufacturers. Orders for manufacturing buildings have begun to slow down but orders for shopping centers and other service-related structures are holding up well, says Gary Heithecker, MBMA chairman.

Medical equipment

Manufacturer's shipments of X-ray and electromedical equipment were expected to grow more than 15% a year through 1989, but U.S. Department of Commerce officials are now scaling back their forecasts. That's not to say that hospitals won't be adding to their depleted equipment inventories, especially around 1987, says Michael Fuchs of the Commerce Dept. New kinds of equipment, such as magnetic resonance imaging units will be on medical centers' shopping lists, says Fuchs, now that the Federal Drug Administration has approved this technology.

Metal stamping producers will ship about $25 million worth of stampings to electromedical equipment producers in 1986, based on PRECISION METAL/Penton Research calculations.

Farm equipment

Farmers need better prices and an improved federal aid program before there will be an upturn in farm equipment sales, says Clyde Jones, president of the St. Louis-based Farm Equipment Manufacturer's Association.

Farm equipment manufacturers spend more than $300 million annually on new machinery, equipment and other capital spending, according to the latest Census reports. Improved productivity from this new equipment should help manufacturers in 1986 when they are expected to sell equipment worth about $5.75 billion to U.S. farmers, according to U.S. Dept. of Agriculture forecasts.

Machine tools

An increase in machine tool orders is expected in 1986, says Ken Kremar, senior economist at Merrill Lynch Economics. Some reasons for Kremar's bullishness include improved corporate profits, a moderate interest rate change, a solid increase in the nation's gross national product for 1986, and large capital spending budgets already set aside in the metalworking industries.

In addition, the National Tooling and Machining Association also is optimistic about next year. Its members, which make molds, tools, gages and dies for firms doing precision machining, expect a 10% increase in industry shipments next year.

Shipbuilding

Statisticians at the Shipbuilders Council of America say any growth in their members' business in 1986 will be limited to U.S. Navy construction and repair. Shipyards relying on commerical work won't see much increase in business. Overall, shipbuilders will spend more than $140 million on castings, extrusions, stampings and other fabricated structural metal for ships and barges in 1986 (based on Census and TFG estimates). This total does not include any captive production.

Manufacturing shipments

Item	Year & Dollar Amount						
	1982	1983	1984	1985	1986	1989	1995
Manufacturing (bil $)	1962.0	2083.0	2292.4	2453.7	2608.1	3216.0	5090.0
Durable manufactures	953.5	1042.3	1172.8	1279.3	1369.9	1722.5	2728.0
Primary metal products (mil$)	104855	107409	113199	121145	127225	152400	226000
Primary iron & steel	46796	43521	46306	50500	53575	63750	90500
Iron & steel foundries	9787	10781	11860	12550	13275	15750	22900
Primary nonferrous metals	11321	12829	11890	12626	12925	15200	23300
Secondary nonferrous metals	4852	5010	5303	5650	5850	7300	11800
Nonferrous rolling & drawing	25465	28481	30504	31480	32475	39950	62000
Nonferrous foundries	4556	4583	5000	5910	6550	7300	10700
Misc primary metal products	2078	2204	2336	2430	2575	3150	4800
Fabricated metal products (mil$)	118484	124464	142505	147095	155300	185400	281000
Metal cans & shipping containers	11951	12704	14013	13255	14175	16700	25200
Cutlery, handtools & hardware	10049	10382	13790	12570	13425	15750	23200
Plumbing & heating equipment	3914	4248	4560	4790	5100	5750	8000
Fabricated structurals	34854	34936	40035	40800	41575	47400	67500
Screw machine products	5738	6271	6869	7250	7675	9200	13700
Metal forgings & stampings	20045	25574	30078	32550	35025	43600	69200
Metal plating & coating	5019	5395	5837	6250	6725	8250	13200
Ordnance & accessories	4801	5069	5601	6080	647	8050	12800
Misc fabricated metal products	22112	19885	21722	23550	25125	30700	48200
Furniture & fixtures (mil$)	24083	27060	29944	31650	33625	42600	68000
Household furniture & bedding	12771	14608	16346	17000	17975	23000	36400
Office furniture	4136	4542	4919	5280	5600	7100	11600
Public building furniture	1083	1183	1301	1400	1500	1900	3000
Partitions & fixtures	3673	4118	4592	4990	5325	6550	10500
Nonelectrical machinery (mil$)	187601	187036	209838	231605	251200	310700	508000
Engines & turbines	12917	12766	13877	14050	14225	16200	23900
Farm & garden machinery	13222	12852	13336	15095	15600	18100	25600
Construction & related machines	31950	25203	27698	29900	32350	37500	53400
Metalworking machinery	18119	15675	18546	20570	22425	25900	36800
Special industry machinery	13518	13544	14649	15740	16925	19600	28300
General industrial machinery	24099	23574	25472	27030	28800	33200	47500
Office & computing machines	43563	51246	61729	72210	81275	114500	227000
Refrigeration & service machines	16230	18235	19328	20460	21650	24900	35600
Electric & electronic equipment (mil$)	148877	165742	191813	214160	239275	306000	523000
Electric distributing equipment	8168	8033	8844	9475	10200	11950	17500
Electrical industrial apparatus	13947	14331	16164	17810	19500	22750	34500
Household Appliances	12674	14787	16656	18130	19725	23400	35100
Lighting & wiring equipment	12104	13382	14813	16005	17350	20750	31400
Consumer electronics	7776	8523	9529	9850	10425	12550	19000
Communications equipment	46676	51292	57597	65420	74250	97950	176000
Electronic components	34495	38713	47785	54090	61125	80450	138000
Transportation equipment (mil$)	202769	245110	282828	319395	336350	445400	684000
Motor vehicles & parts	111967	146325	178517	194550	200600	276000	405000
Aircraft & parts	53779	62574	63096	76420	83200	100500	160000
Ships, boatbuilding & repairs	13492	13407	13718	13990	14625	19050	30500
Railroad equipment	3461	1170	2469	5245	5750	6950	11400
Motorcycles, bicycles & parts	1215	1376	1501	1590	1700	2150	3400
Missiles, space vehicles & parts	14379	14504	16951	20390	22550	30900	58000
Instruments & related products (mil$)	51696	54364	60374	65870	71725	92500	156000
Engineering & scientific instruments	3179	3314	3537	3830	4150	5250	8600
Measuring & controlling device	14480	15433	17979	19805	21750	28800	49500
Optical & analytical instruments	3557	3987	4370	4700	5125	6650	11800
Medical instruments & supplies	10863	11909	13303	14750	16225	21500	38600

Source: TFG Composite Forecasts

Die casting

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But one die caster is attacking foreign imports on their own ground. Chicago White Metal Casting Inc. will mark 1985 as its biggest year for die casting shipments to Taiwan.

"If die casters moan and think things in the industry are bad, then things are only going to be bad," said Walter Treiber, president of Chicago White Metal Casting.

"We must attack foreign imports on their own ground. We are increasing our shipments to the United Kingdom, Taiwan, and Puerto Rico, and have representatives in West Germany. We're expanding throughout the world."

Treiber predicted an increase of about 23% to 25% in 1986 for the die casting industry, stating that the majority of the increase will come from the magnesium die casting field. Treiber also anticipates growth in aluminum and zinc, predicting that aluminum will increase about 8% to 10% as the base ingot price drops.

Findlay estimated that aluminum die casting will grow at a "reasonable rate" of about 4% to 6% in 1986, and zinc will grow at a lesser rate of about 1% to 2% next year. Magnesium will experience a rapid growth percent wise, Findlay said, increasing about 15% to 20%. Factors for the increase in magnesium include increasing use of hot-chamber technology, relatively stable alloy pricing, development of a more corrosion-resistant high-purity alloy, and development of new magnesium applications in several industries.

Developing new markets is a must for the industry, according to Findlay, who said that there is still a tremendous potential to replace what is going overseas.

"We were faced with two options," he said. "We could go to Washington and sing the blues, but that's not the way to go. The point is to go out and learn how to compete. We must improve our products and change our management practices. We need to work smarter instead of harder."

Powder metallurgy

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itself is increasing. A number of manufacturers are now discovering the process has potential in their component design programs. This is due in large part to MPIF advertising and marketing programs, which promote P/M as a realistic alternative to other forms of metalworking.

But the excitement and potential of P/M techniques remain the best promoter. As the vice president of a major P/M part producing company in the Northeast puts it, "P/M has come a long way from the standard approach of dumping powder into a hole. Now it is just a matter of educating the world that the capabilities are real and the process is a viable manufacturing technique."

Stamping

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speed, high volume stamper on the one end, to the relatively low speed, high labor intensive fabricator on the other end," adds Jenson.

Implementation of modern manufacturing techniques are beginning to appear in stamping. The importance of these modern methods will grow as it becomes more apparent that their use will be necessary to remain competitive. Presently, CAD/CAM is used mostly in wire cutting of die sections, but is being extended into manufacturing operations. The requirements for SPC and SQC are also making it necessary to begin integrating computer functions.

But a manufacturer of custom stampings in the Northeast, believes that the best way to stay economically healthy is to produce the finest quality part possible, and this must begin with employees of the stamping operation. "The personnel must look at the stamped part they are making, believe it is a decent product, and would therefore purchase it themselves. Too many don't care. That is the biggest problem we have now. We must get the employees to care—to get that pride back they once had years ago."

Office equipment

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ume of 60.4 million pounds in 1986, up from 52.5 million pounds in 1983. Longer range prospects are shipments of 72.9 million pounds in 1990. Zinc and magnesium die castings represent a small but growing part of the market with expected compound annual rate of growth above 5%.

The properties of die castings to shield against electromagnetic and radio frequency interference will be a big factor favoring them over molded plastics for housings and connector backshells. Still, housings and structural components appear to be firmly established as die castings.

Powder metallurgy stands to continue as a major supplier to the office equipment industry. Loss of market share to imported copiers and computers may be offset by the development of new office products.

Although computerization and electronics have supplanted many of the mechanical components in business machines that were formerly made as high precision P/M parts, there are still millions of P/M parts in the paper-handling parts of these devices. This continues to be a strong market for P/M.

Aircraft & Aerospace

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strong nationalism which encourages the foreign aircraft builders to buy at home whenever possible, at this time they still need to come to U.S. sources where higher levels of technology are available. Shiel believes that within five years the European sources may catch up on technology. That is one reason many U.S. foundries have opened plants overseas to be near the developing new business.

Among other trends that may affect the business of investment casters in the foreseeable future are the near net shape concept, single crystal casting, HIP, and pressure from some airframe builders to develop methods for casting the aluminum-lithium alloys. **PM**